

## Claims

What is claimed is:

- 1           1.     A method for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain comprising the steps of:  
3           connecting a first edge expander to a first port of a plurality of SAS  
4 devices for enabling communications between each of said plurality of SAS  
5 devices through said first edge expander;  
6           connecting a second edge expander to a second port of said plurality  
7 of SAS devices for enabling communications between each of said plurality  
8 of SAS devices through said second edge expander; and  
9           connecting together a subtractive routing port of each of said first  
10 edge expander and said second edge expander for enabling  
11 communications between each of said plurality of SAS devices via said first  
12 ports and said second ports of said plurality of SAS devices.
- 1           2.     A method for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 1 wherein the step of  
3 connecting said first edge expander includes the step of connecting  
4 respective direct routing ports of said first edge expander to said first port of  
5 said plurality of SAS devices; and wherein the step of connecting said  
6 second edge expander includes the step of connecting respective direct  
7 routing ports of said second edge expander to said second ports of said  
8 plurality of SAS devices.
- 1           3.     A method for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 1 includes the step of  
3 ganging together multiple point-to-point links to form said subtractive routing  
4 ports of said first edge expander and said second edge expander for  
5 enabling multiple concurrent connections with said subtractive routing ports.
- 1           4.     A method for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 1 includes the step of  
3 utilizing said subtractive routing ports of said first edge expander and said  
4 second edge expander for communicating from said first ports of said  
5 plurality of SAS devices to said second ports of said plurality of SAS devices.

1           5.     A method for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 1 includes the step of  
3 utilizing said subtractive routing ports of said first edge expander and said  
4 second edge expander for communicating from said second ports of said  
5 plurality of SAS devices to said first ports of said plurality of SAS devices.

1           6.     A method for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 1 includes the step of  
3 selectively utilizing said subtractive routing ports of said first edge expander  
4 and said second edge expander for workload balancing of communications  
5 between said plurality of SAS devices with a failure of one or more of said  
6 first and second ports of said plurality of SAS devices.

1           7.     Apparatus for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain comprising:  
3                 a plurality of SAS devices, each having a first port and a second port;  
4                 a first edge expander and a second edge expander, each edge  
5 expander having a plurality of direct routing ports and a subtractive routing  
6 port;  
7                 each of said plurality of direct routing ports of said first edge expander  
8 respectively connected to said first port of a respective one of said plurality  
9 of SAS devices for enabling communications between each of said plurality  
10 of SAS devices;  
11                 each of said plurality of direct routing ports of the second edge  
12 expander respectively connected to said second port of a respective one of  
13 said plurality of SAS devices for enabling communications between each of  
14 said plurality of SAS devices; and  
15                 said subtractive routing ports of said first edge expander and said  
16 second edge expander connected together for enabling communications  
17 between each of said plurality of SAS devices via said first ports and said  
18 second ports of said plurality of SAS devices.

1           8.     Apparatus for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 7 wherein said subtractive  
3 routing ports of said first edge expander and said second edge expander  
4 include multiple point-to-point links enabling multiple concurrent connections.

1           9.     Apparatus for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 7 wherein said subtractive  
3 routing ports of said first edge expander and said second edge expander are  
4 used for communicating from said first ports of said plurality of SAS devices  
5 to said second ports of said plurality of SAS devices.

1           10.    Apparatus for implementing resilient connectivity in a Serial  
2 Attached SCSI (SAS) domain as recited in claim 7 wherein said subtractive  
3 routing ports of said first edge expander and said second edge expander are  
4 used for communicating from said second ports of said plurality of SAS  
5 devices to said first ports of said plurality of SAS devices.

1           11.    A Serial Attached SCSI (SAS) network for implementing  
2 resilient connectivity in a SAS domain comprising:  
3           a first edge expander and a second edge expander, each edge  
4 expander having a plurality of direct routing ports and a subtractive routing  
5 port;  
6           each of said plurality of direct routing ports of said first edge expander  
7 respectively connected to said first port of a respective one of a plurality of  
8 SAS devices for enabling communications between each of said plurality of  
9 SAS devices;  
10          each of said plurality of direct routing ports of the second edge  
11 expander respectively connected to a second port of a respective one of  
12 said plurality of SAS devices for enabling communications between each of  
13 said plurality of SAS devices; and  
14          said subtractive routing ports of said first edge expander and said  
15 second edge expander connected together for enabling communications  
16 between each of said plurality of SAS devices via said first ports and said  
17 second ports of said plurality of SAS devices.

1           12.    A Serial Attached SCSI (SAS) network as recited in claim 11  
2 wherein said subtractive routing ports of said first edge expander and said  
3 second edge expander include multiple point-to-point links enabling multiple  
4 concurrent connections.